

REMARKS/ARGUMENTS

Claims 6, 7 and 12-15 are active in this application.

The claimed invention provides an ultrasonic sensor comprising: a  $\gamma$ -Al<sub>2</sub>O<sub>3</sub> single crystal film epitaxially grown on a semiconductor single crystal substrate; an epitaxial single crystal Pt thin film disposed on the  $\gamma$ -Al<sub>2</sub>O<sub>3</sub> single crystal film; a highly oriented ferroelectric thin film disposed on the epitaxial single crystal Pt thin film; and an upper electrode disposed on the ferroelectric thin film; wherein the semiconductor single crystal substrate is subjected to a treatment for adjusting a resonant frequency and an ultrasonic wave to be detected. No such ultrasonic sensor is disclosed or suggested in the cited references.

Applicants respectfully note the Office's statement (Official Action dated October 10, 2008, page 2, lines 4-18) in pertinent part:

"The declaration filed on August 18, 2008 under 37 CFR 1.131 has been considered but is ineffective to overcome the Sakashita et al. ( . . . ) reference. . . . The evidence submitted is insufficient to establish conception coupled with due diligence. . . . The declaration with the program of a research report meeting at National University Corporation TOYOHASHI UNIVERSITY OF TECHNOLOGY and the summary of the presented report does not contain evidence regarding due diligence."

Applicants herein submit a second Declaration under 37 C.F.R. § 1.131 (attached) which describes a chronological series of events, all of which took place prior to December 27, 2002. Document 1 proposes an ultrasonic sensor represented by Fig. 1 and described in the text and in Table 1 as a silicon single crystal substrate, an epitaxial  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, a Pt(100) oriented film and a oriented PZT film. Fig. 1 corresponds to Fig. 10 in the present application. Initial unsuccessful attempts to prepare the described layer combination are reported.

Document 2 describes subsequent investigation and modification of the heating device for the purpose of growing the proposed film layer structure.

Document 3 reports continued experimentation with the modified heating device and Sample No. 49 shows successful epitaxial growth of Pt (100) on Al<sub>2</sub>O<sub>3</sub> (100).

Documents 4 and 5 were previously submitted as Documents 1 and 2 and Document 5 (previous 2) describes the successful production of single crystalline Pt epitaxial to  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>.

The rejection of Claim 6 under 35 U.S.C. 103(a) over Pohjonen et al. (U.S. 6,242,843) in view of Higuchi et al. (U.S. 2005/0179342) and further in view of Sakashita et al. (U.S. 2005/0040516) is respectfully traversed.

Sakashita is cited to show epitaxially grown  $\gamma$ -Al<sub>2</sub>O<sub>3</sub> film as a buffer layer between a lower electrode and a support substrate.

However, in view of the declaration of Mr. Hirabayashi described above, Applicants respectfully submit that Sakashita is not available as prior art.

Applicants respectfully submit that the attached Declaration under 37 C.F.R. § 1.131 by Inventor Keisuke Hirabayashi provides documents which describe successfully depositing epitaxial Pt (001) films on a  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>(001)/Si(001) substrate. Mr. Hirabayashi declares that these documents were published prior to December 27, 2002, and therefore reduction to practice of formation of an epitaxial Pt (001) film on a  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>(001)/Si(001) substrate is established prior to December 27, 2002, the filing date of Sakashita et al.

Applicants respectfully note *In re Stempel*, 241 F.2d 755, 113 USPQ 77 (CCPA 1957) which states:

“When a reference is not a statutory bar, Rule 131 provides a procedure by which the applicant is permitted to show, if he can, that his date of invention was earlier than the date of the reference. The rule must be construed in accordance with the rights given to inventors by statute and this excludes a construction permitting the further use of a reference as a ground of rejection after all pertinent subject matter in it has been antedated to the satisfaction of the Patent Office.”

**“We are convinced that under the law all the applicant can be required to show is priority with respect to so much of the claimed invention as the references happens to show. When he has done that he has disposed of the reference.”** (Bold added)

As established in the paper submitted with the Response filed January 22, 2008, Applicants were the first to actually successfully grow and describe an epitaxial Pt (001) thin film on a Si (001) substrate using an epitaxial  $\gamma$ -Al<sub>2</sub>O<sub>3</sub> (001) buffer layer (Journal of Crystal Growth, 264 (2004) 463-467).

Accordingly, Applicants respectfully submit that Sakashita does not qualify as prior art and cannot be cited as a reference in support of any rejection.

The combination of Pohjonen and Higuchi does not disclose or suggest the ultrasonic sensor as described in Claim 6 of the claimed invention.

Pohjonen is directed to resonator structures for radio communication apparatus which contain three basic elements: a) an acoustically active piezoelectric layer, b) electrodes on opposite sides of the piezoelectric layer, and c) acoustical isolation from the substrate. The Office has cited Fig. 7 of this reference and alleges that this Figure discloses a structure as described in Claim 6 of the present invention. In Pohjonen's Fig. 7, the bottom electrode (110) is isolated from the substrate (200) by a membrane layer (130). The reference neither discloses nor suggests a crystalline structural relationship interrelating the substrate, membrane layer, bottom electrode and the piezoelectric layer as according to the claimed invention.

Applicants respectfully note the Examiner's repeated reference to "product by process" limitation. However, Applicants respectfully submit that the phrases "epitaxially grown" and "epitaxial single crystal . . . disposed on" are descriptive of a crystal orientation relationship between the respective single crystal thin films, where a deposited film takes on a lattice structure and orientation identical to those of the substrate. It is this single crystal orientation relationship between the respective thin films which is described in Claim 6 and this relationship is such that the Pt single crystal of the Pt thin film is epitaxial with respect to the  $\gamma$ -Al<sub>2</sub>O<sub>3</sub> single crystal, which is epitaxial to the single crystal of the semiconductor substrate.

The Office has cited Higuchi to show that a single crystal platinum film as an electrode and a well oriented piezoelectric film are well known in the art.

However, Applicants respectively point out that neither Pohjonen nor Higuchi discloses or suggests a  $\gamma$ -Al<sub>2</sub>O<sub>3</sub> single crystal thin film between the bottom electrode and a substrate having an epitaxial relationship with the substrate and the bottom electrode as described in Claim 6 of the present invention.

In view of the above, withdrawal of the rejection of Claim 6 under 35 U.S.C. 103(a) over Pohjonen in view of Higuchi and further in view of Sakashita is respectfully requested.

The rejection of Claims 7, 13 and 15 under 35 U.S.C. 103(a) over Pohjonen in view of Higuchi and further in view of Sakashita and further in view of Ziegler (U.S. 6,238,946), Ando et al. (2004/0021401) and Tabata et al. (U.S. 5,354,732) is respectfully traversed.

Applicants respectfully note that Sakashita has been antedated by the attached Declaration and therefore submit that it is not available as a reference. Claims 7, 13 and 15

all directly or indirectly depend from Claim 6. The deficiencies of the combination of Pohjonen and Higuchi are described above.

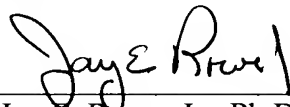
Ziegler is cited to show use of silicon on insulator (SOI) substrate. Ando is cited to show etching of Si single crystal (100) face and Tabata is cited to show gold black as an electrode material. However, Applicants respectfully submit that none of the cited secondary references disclose or suggest an ultrasonic sensor according to Claim 6, and therefore, cannot cure the deficiency of the primary reference combination as described above.

Accordingly, withdrawal of the rejections of Claims 7, 13 and 15 under 35 U.S.C. 103(a) over Pohjonen et al. in view of Higuchi et al. and further in view of Sakashita et al. and further in view of Ziegler (U.S. 6,238,946), Ando et al. (2004/0021401) and Tabata et al. (U.S. 5,354,732) is respectfully requested.

Applicants respectfully submit that the above-identified application is now in condition for allowance and early notice of such action is earnestly solicited.

Respectfully submitted,

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